# CLAIMS

What is claimed is:

1. A method for counting a set of tags, each tag having at least one resonant element, the method comprising:

    (a) having at least one reference resonant frequency, $\omega_0$, common to the tags;

    (b) measuring the resulting resonant frequency, $\omega$, of the set of interacting tags; and

    (c) determining the number of tags in the set, $n$, using the measured frequency and the reference frequency.

2. The method of claim 1 wherein the reference resonant frequency is measured.

3. The method of claim 1 wherein the reference resonant frequency is computed from at least one of the known geometry and the physical dimensions of a tag.

4. The method of claim 1 wherein each tag comprises one or more resonant elements.

5. The method of claim 1 wherein each tag is identical to the other tags of the set.

6. The method of claim 1 wherein the set of tags comprises multiple subsets of resonant elements, each subset of resonant elements having its own resonant frequency.

7. The method of claim 1 wherein each tag is affixed to a movable object.

8. The method of claim 1 wherein the set of tags is arranged in a stack.

9. The method of claim 8 wherein pairs of adjacent tags in the stack have a substantially equal spacing.

10. The method of claim 1 wherein $n$ is a monotonic function of the measured resonant frequency.

11. The method of claim 1 wherein each tag present has an inductance, $L$, and the number of tags present is given by a value substantially equal to $\sqrt{\frac{L^2\left(\omega^2-\omega_0^2\right)}{\omega^2 M^2}+1}$, where $M$ is the mutual inductance between the individual tags.

12. The method of claim 1 wherein the reference frequency is provided as a regression-fit function to a plurality of empirical measurements of the number of tags in a test set and the resonant frequency of the test set.

13. The method of claim 1 wherein the reference frequency is provided as a value determined from at least one measurement of a single tag.

14. The method of claim 1 wherein the reference frequency is provided as a value determined from at least one measurement of a plurality of tags.

15. The method of claim 1 wherein the reference frequency is provided as a value computed from the known geometry and dimensions of each tag in the set.

16. A method for determining a separation between a pair of tags, each tag having at least one resonant element, the method comprising:

(a) having at least one reference resonant frequency, $\omega_0$, common to the tags;

(b) measuring the resulting resonant frequency, $\omega$, of the pair of interacting tags; and

(c) determining the separation between the pair of tags using the measured frequency and the reference frequency.

17. The method of claim 16 wherein the separation is a lateral distance.

18. The method of claim 16 wherein the separation is an axial distance.

19. The method of claim 16 wherein each tag is affixed to a movable object.

20. The method of claim 16 wherein the reference frequency is provided as a regression-fit function to a plurality of empirical measurements of the separation between a test pair of tags and the resonant frequency of the test pair.

21. The method of claim 16 wherein the reference frequency is provided as a value determined from at least one measurement of a single tag.

22. The method of claim 16 wherein the reference frequency is provided as a value determined from at least one measurement of a plurality of tags.

23. The method of claim 16 wherein the reference frequency is provided as a value computed from known parameters of a resonant element in the set.

24. The method of claim 16 wherein determining the separation comprises determining the mutual inductance between the pair of tags and determining the separation using the mutual inductance.

25. An apparatus for counting a set of tags, each tag having at least one resonant element, the apparatus comprising:

a source providing at least one reference resonant frequency, $\omega_0$, common to all tags;
a sensor for measuring the resultant resonant frequency, $\omega$, of the set of interacting tags;
a computational element for determining the number of tags in the set, $n$, using the measured frequency and the reference frequency.

26. The apparatus of claim 25 wherein the reference resonant frequency is measured.

27. The apparatus of claim 25 wherein the reference resonant frequency is computed from at least one of the known geometry and the physical dimensions of a tag.

28. The apparatus of claim 25 wherein each tag comprises one or more resonant elements.

29. The apparatus of claim 25 wherein each tag is identical to the other tags of the set.

30. The apparatus of claim 25 wherein the set of tags comprises multiple subsets of resonant elements, with each subset of resonant elements having its own resonant frequency.

31. The apparatus of claim 25 wherein each tag is affixed to a movable object.

32. The apparatus of claim 25 wherein the set of tags is arranged in a stack.

33. The apparatus of claim 32 wherein pairs of adjacent tags in the stack have a substantially equal spacing.

34. The apparatus of claim 25 wherein *n* is a monotonic function of the measured resonant frequency.

35. The apparatus of claim 25 wherein each tag present has an inductance, *L*, and the number of tags present is given by a value substantially equal to $\sqrt{\frac{L^2(\omega^2 - \omega_0^2)}{\omega^2 M^2} + 1}$, where *M* is the mutual inductance between the individual tags.

36. The apparatus of claim 25 wherein the reference frequency is provided as a regression-fit function to a plurality of empirical measurements of the number of tags in a test set and the resonant frequency of the test set.

37. The apparatus of claim 25 wherein the reference frequency is provided as a value determined from at least one measurement of a single tag.

38. The apparatus of claim 25 wherein the reference frequency is provided as a value determined from at least one measurement of a plurality of tags.

39. The apparatus of claim 25 wherein the reference frequency is provided as a value computed from known parameters of a resonant element in the set.

40. An apparatus for determining a separation between a pair of tags, the apparatus comprising:

a source providing at least one reference resonant frequency, $\omega_0$, common to the tags;

a sensor for measuring the resulting resonant frequency, $\omega$, of the pair of interacting tags; and

a computational element for determining the separation between the pair of tags using the measured frequency and the reference frequency.

41. The apparatus of claim 40 wherein the separation is a lateral distance.

42. The apparatus of claim 40 wherein the separation is an axial distance.

43. The apparatus of claim 40 wherein each tag is affixed to a movable object.

44. The apparatus of claim 40 wherein the reference frequency is provided as a regression-fit function to a plurality of empirical measurements of the separation between a test pair of tags and the resonant frequency of the test pair.

45. The apparatus of claim 40 wherein the reference frequency is provided as a value determined from at least one measurement of a single tag.

46. The apparatus of claim 40 wherein the reference frequency is provided as a value determined from at least one measurement of a plurality of tags.

47. The apparatus of claim 40 wherein the reference frequency is provided as a value computed from known parameters of a resonant element in the set.

48. The apparatus of claim 40 wherein the computational element determines the mutual inductance between the pair of tags and determines the separation using the mutual inductance.